Claims: I claim:

1. A method for enhancing image quality comprising:

developing a usefulness metric which identifies a limit to sharpness enhancement that can be applied to decoded video without enhancing coding artifacts; and

applying the usefulness metric to at least one sharpness enhancement algorithm, the usefulness metric and the sharpness enhancement algorithm being separate such that the usefulness metric can be used with a variety of algorithms.

2. A method for enhancing the sharpness of a coded digital video, comprising the steps of:

selecting and extracting statistical information from a coded video bit stream in order to identify the video's coding complexity;

based upon the coding complexity, developing a usefulness metric for the coded video, which identifies a limit to sharpness enhancement that can be applied to the coded video after it is decoded, without enhancing coding artifacts; and

applying a sharpness enhancement algorithm to the decoded video to increase sharpness within the limit prescribed by the usefulness metric.

3. The method as claimed in claim 2 wherein the sharpness enhancement algorithm is a peaking algorithm

4. The method as claimed in claim 2 wherein the sharpness enhancement algorithm is a spatial-domain algorithm

5. The method as claimed in claim 2 wherein the usefulness metric is calculated on a pixel-by-pixel basis

6. The method as claimed in claim 2 wherein the coding complexity is defined as the product of a quantization parameter and a number of bits used to code a macro block

7. The method as claimed in claim 2 wherein the coding complexity is defined as the product of a quantization parameter and a number of bits used to code a block.

8. The method as claimed in claim 2, wherein the usefulness metric occupies a range, a first terminus of the range meaning no sharpness enhancement is allowed for a

particular pixel and second terminus of the range meaning that the pixel can be freely enhanced

9. The method as claimed in claim 2, wherein the method is also applied to skipped macroblocks, the usefulness metric being estimated based upon the coding complexity of surrounding macro blocks or the coding complexity of a previous frame

10. The method as claimed in claim 2, wherein the method is also applied to uncoded blocks, the usefulness metric being estimated based upon the coding complexity of surrounding blocks or the coding complexity of a previous frame

11. The method as claimed in claim 2, wherein in addition to the usefulness metric, scene-content related information is incorporated into a coding gain calculation

12. The method as claimed in claim 2, wherein the scene-content related information is derived from edge information

13. The method as claimed in claim 5, wherein coding gain of a pixel is determined by the equation:

$$g_{coding}(i,j) = UME(i,j) + g_{edge}(i,j)$$

and wherein i and j are pixel coordinates, g_{coding} is the pixel coding gain, UME is the usefulness metric and g_{edge} is based upon edge-related information derived from the image

14. The method as claimed in claim 13, wherein spatial low-pass filtering is applied to a complexity map calculated from the coded digital video.

15. The method as claimed in claim 13, wherein temporal filtering is applied to the coding gain using the coding gain of a previous frame

16. The method as claimed in claim 13, wherein the equation can be extended to include an additional term directly related to the quantization parameter

17. The method as claimed in claim 6, wherein a block-based complexity map is filtered temporally using an IIR filter.

18. The method as claimed in claim 6, wherein a macro block-based complexity map is filtered temporally using an IIR filter.

19. The method as claimed in claim 17 or 18, wherein the temporal filtering is in accordance with the following equation:

$$compl_{MB/block}(r,s,t) = k * compl_{MB/block}(r,s,t) + scal * (1-k) * compl_{MB/block}(r,s,t-1)$$

and wherein r,s is the spatial coordinate of a macro block or block, t represents the current picture, k is the IIR filter coefficient and scal is a scaling term taking into account picture complexity determined by the image's picture type.

20. A device for image quality enhancement comprising:

a peaking filter which filters a decoded luminance signal, generating a high pass signal;

a plurality of pixel based control blocks, operating in parallel on the decoded luminance signal, each calculating a maximum allowable gain factor, based upon a characteristic of the luminance signal, wherein at least one control block is a coding gain block which implements a usefulness metric which determines the allowable amount of peaking;

a dynamic gain control for selecting a minimum gain based upon the calculated maximum gain factors;

a multiplier for multiplying the high pass signal by the minimum gain generating a multiplied signal; and

an adder for combining the decoded luminance signal with the multiplied signal, generating an enhanced signal.

21. A device as claimed in claim 22, wherein the control blocks comprise:

a contrast control block;

a dynamic range control block;

a clipping prevention control block;

an adaptive coring control block; and

a coding gain block, all of the blocks being connected in parallel

22. A device for enhancing the image quality of a digital video comprising:

a usefulness metric generator which identifies a limit to sharpness enhancement that can be applied, without enhancing coding artifacts, to decoded digital video;

a controller which applies the usefulness metric to at least one sharpness enhancement algorithm, the usefulness metric and the sharpness enhancement algorithm being

separate such that the usefulness metric can be used with a variety of algorithms.

23. A system which enhances sharpness of a coded digital video, comprising:

a selector which selects and extracts statistical information from a coded video bit stream in order to identify the video's coding complexity;

a usefulness metric generator that, based upon the coding complexity, develops a usefulness metric for the coded digital video after decoding, which identifies a limit to sharpness enhancement that can be applied to a decoded video without enhancing coding artifacts; and

a sharpness enhancer which applies a sharpness enhancement algorithm to the decoded video to increase sharpness within the limit prescribed by the usefulness metric.

24. The system as claimed in claim 23, wherein the sharpness enhancement algorithm is a peaking algorithm.

25. The system as claimed in claim 23, wherein the sharpness enhancement algorithm is a spatial-domain algorithm.

26. The system as claimed in claim 23, wherein the usefulness metric is calculated on a pixel-by-pixel basis.

27. The system as claimed in claim 23, wherein the coding complexity is defined as the product of a quantization parameter and a number of bits used to code a macro block

28. The system as claimed in claim 23, wherein the coding complexity is defined as the product of a quantization parameter and a number of bits used to code a block

29. The system as claimed in claim 23, wherein the usefulness metric occupies a range, a first terminus of the range zero meaning no sharpness enhancement is allowed for a particular pixel and a second terminus of the range meaning that the pixel can be freely enhanced.

30. The system as claimed in claim 23 wherein the system is also applied to skipped macro blocks, the usefulness metric being estimated based upon the coding complexity of surrounding macro blocks or based upon the coding complexity of a previous frame.

31. The system as claimed in claim 23, wherein the system is also applied to uncoded blocks, the usefulness metric being estimated based upon the coding complexity of surrounding blocks or the coding complexity of a previous frame.

32. The system as claimed in claim 23, wherein in addition to the usefulness metric, scene-content related information is incorporated into a coding gain calculation.

33. The system, as claimed in claim 32, wherein the scene-content related information is derived from edge information.

34. The system as claimed in claim 23, wherein coding gain of a pixel is determined by the equation:

$$g_{coding}(i,j) = UME(i,j) + g_{edge}(i,j)$$

and wherein i and j are pixel coordinates, g_{coding} is the pixel coding gain, UME is the usefulness metric and g_{edge} is derived from edge-related information derived from the image.

35. The system as claimed in claim 23, wherein spatial low-pass filtering is applied to a complexity map calculated from the coded digital video stream.

36. The system as claimed in claim 23, wherein temporal filtering is applied to a coding gain based upon a coding gain of a previous frame.

37. The system as claimed in claim 34, wherein the equation can be extended to include an additional term directly related to the quantization parameter.

38. The system as claimed in claim 36, wherein a block-based complexity map is filtered temporally using an IIR filter.

39. The method as claimed in claim 36, wherein a macro block-based complexity map is filtered temporally using an IIR filter.

40. The system as claimed in claim 36, wherein the temporal filtering is in accordance with the following equation:

$compl_{MB/block}(r,s,t) = k * compl_{MB/block}(r,s,t) + scal * (1-k) * compl_{MB/block}(r,s,t-1)$

and wherein r,s is the spatial coordinate of a macroblock (MB) or block, t represents the current picture, k is the IIR filter coefficient and scal is a scaling term taking into account picture complexity determined by the image's picture type.

41. Computer-executable process steps to enhance image quality, the computer-executable process steps being stored on a computer-readable medium and comprising:

an extracting step to extract statistical information from a coded video bit stream in order to identify a video's coding complexity;

a generating step to generate a usefulness metric for a coded video based upon the coding complexity, which identifies a limit to sharpness enhancement that can be applied to the coded video after decoding without enhancing coding artifacts; and

an enhancement step to enhance the sharpness of the image by applying a sharpness enhancement algorithm to a decoded video to increase sharpness within the limit prescribed by the usefulness metric.

42. Means for enhancing the sharpness of a coded digital video, comprising:

extracting means for extracting statistical information from a coded video bit stream in order to identify the coded digital video's coding complexity;

generating means for developing a usefulness metric for the coded digital video, based upon the coding complexity, which identifies a limit to sharpness enhancement that can be applied to the coded digital video after decoding without enhancing coding artifacts; and

enhancement means for applying a sharpness enhancement algorithm to a decoded video to increase sharpness within the limit prescribed by the usefulness metric.

43. A signal, embodied in a carrier wave, representing data for enhancing sharpness of a decoded digital video, comprising:

statistical information selected from a coded video bit stream to be used in identifying the complexity of a video;

a usefulness metric, based upon the complexity of the video, which identifies a limit to sharpness enhancement

which can be applied to the decoded video without enhancing coding artifacts; and

a sharpness enhancement algorithm to be used for increasing the sharpness of the decoded video within the limit prescribed by the usefulness metric.

44. A method for enhancing image quality comprising the steps of:

peaking filtering a coded luminance signal, increasing the amplitude of the luminance signal and generating a high pass signal;

calculating at least one maximum gain factor for the luminance signal, based on a characteristic of the luminance signal, wherein at least one gain factor calculation implements a usefulness metric which determines an allowable amount of peaking which will not intensify coding artifacts;

selecting a minimum gain from the maximum gain factors;

multiplying the high pass signal by the minimum gain generating a multiplied signal; and

adding a decoded luminance signal with the multiplied signal, generating an enhanced signal.

45. A video receiving device comprising:

a peaking filter which filters a decoded luminance signal, generating a high pass signal;

a plurality of pixel based control blocks, operating in parallel on the decoded luminance signal, each calculating a maximum allowable gain factor, based upon a characteristic of the luminance signal, wherein at least one control block is a coding gain block which implements a usefulness metric which determines the allowable amount of peaking;

a dynamic gain control for selecting a minimum gain based upon the calculated maximum gain factors;

a multiplier for multiplying the high pass signal by the minimum gain generating a multiplied signal; and an adder for combining the decoded luminance signal with the multiplied signal, generating an enhanced signal.